CLAIMS

We claim:

1. A circuit for synchronously exchanging bidirectional data, comprising:

at least two driving entities connected to a bus for sending and receiving data to each other, said at least two driving entities each comprising a master latch having scan-in port for receiving a scan test vector;

a swapper circuit electrically connected to said bus at a connection point between said at least two driving entities, said swapper circuit for capturing data simultaneously traveling in opposite directions on said bus and passing said captured data back onto said bus avoiding collision of the data; and

a capture latch at either end of said bus for capturing received data.

2. A circuit for synchronously exchanging bidirectional data as recited in claim 1 further comprising:

a slave latch having an input connected to an output of said master latch, said slave latch having a scan-out port for outputting the scan test vector.

3. A circuit for synchronously exchanging bidirectional data as recited in claim 1 wherein said at least two driving entities comprise:

a tri-state circuit connected to said master latch for driving data output from said master latch onto said bus.

4. A circuit for synchronously exchanging bidirectional data as recited in claim 1 wherein said swapper circuit comprises:

a first latch and tri-state circuit pair connected to said bus for providing a path for data traveling on said bus in one direction; and

a second latch and tri-state circuit pair connected to said bus for providing a path for data traveling on said bus in an opposite direction.

5. A circuit for synchronously exchanging bidirectional data as recited in claim 2 wherein said first latch and said second latch of said swapper circuit are connected to receive a system clock and a scan clock.

6. A circuit for synchronously exchanging bidirectional data as recited in claim 2 wherein a plurality of said circuits for synchronously exchanging bidirectional data are connected together with said scan-out port of a first circuit connected to a scan-in port of a second circuit.

7. A circuit for synchronously exchanging bidirectional data, comprising:

at least two driving entities connected to a bus for sending and receiving data to each other, said at least two driving entities each comprising a master latch having scan-in port for receiving a scan test vector and a data output port connected to said bus;

a swapper circuit electrically connected to said

bus at a connection point between said at least two driving entities, said swapper circuit for capturing data simultaneously traveling in opposite directions on said bus and passing said captured data back onto said bus avoiding collision of the data; and

a capture latch at either end of said bus for capturing received data,

wherein a plurality of said circuits for synchronously exchanging bidirectional data are connected together to form at least one scan chain.

8. A circuit for synchronously exchanging bidirectional data as recited in claim 7, further comprising:

a scan only latch having a scan-out port for outputting the scan test vector, wherein an output of said master latch is connected to an input of said scan only latch to form said at least one scan chain.

9. A circuit for synchronously exchanging bidirectional data as recited in claim 7, wherein a data out port of said master latch is connected to said scan-in port of a next master latch wherein said at least one scan chain zig-zags back and forth through alternating ones of said of said master latches and swapper circuits.

10. A circuit for synchronously exchanging bidirectional data as recited in claim 7 wherein said at least two driving entities comprise:

a tri-state circuit connected to said master latch for driving data output from said master latch onto said bus.

11. A circuit for synchronously exchanging bidirectional data as recited in claim 7 wherein said swapper circuit comprises:

a first latch and tri-state circuit pair connected to said bus for providing a path for data traveling on said bus in one direction; and

a second latch and tri-state circuit pair connected to said bus for providing a path for data traveling on said bus in an opposite direction.

12. A circuit for synchronously exchanging bidirectional data as recited in claim 11 first latch and tri-state circuit pair and said second latch and tri-state circuit pair are connected to receive system clocks and scan clocks.

13. A method for scan testing a circuit for synchronously exchanging bidirectional data, comprising the steps of:

providing at least two driving entities connected to a bus for sending and receiving data to each other, said at least two driving entities each comprising a master latch having scan-in port;

electrically connecting a swapper circuit to said bus at a connection point between said at least two driving entities, said swapper circuit for capturing data simultaneously traveling in opposite directions on said bus and passing said captured data back onto said bus avoiding collision of the data;

connecting a capture latch at either end of said bus for capturing received data;

connecting a slave latch connected to an output of

said master latch, said slave latch having a scan-out port for outputting the scan test vector;

connecting said driving entities, said swapper and said capture latch and said slave latch to a plurality of synchronous clocks;

inputting a scan test vector into said scan-in port;

enabling ones of said synchronous clocks to move said scan test vector through said circuit for one of a plurality of test patterns; and

reading data output from said scan-out port.

14. A method for scan testing a circuit for synchronously exchanging bidirectional data as recited in claim 13 wherein said test pattern is a unidirectional test pattern moving said scan test vector from one of an X direction to a Y direction and a Y direction to an X direction.

15. A method for scan testing a circuit for synchronously exchanging bidirectional data as recited in claim 13 wherein said test pattern is a bi-directional test pattern moving a first scan test vector from an X direction to a Y direction and a second test vector from a Y direction to an X direction.

16. A method for scan testing a circuit for synchronously exchanging bidirectional data as recited in claim 13 further comprising the step of:

connecting said scan-out port to a scan in port of a next one of said circuits for synchronously

exchanging bidirectional data, such that a plurality of said circuits are connected together in series.

17. A method for scan testing a circuit for synchronously exchanging bidirectional data as recited in claim 16 wherein said test pattern is one of an “S” test pattern and a “Z” test pattern.